

News Briefs 2	Students Learn the JPL Way 3
Special Events Calendar 2	Teacher Workshops 3
Mission Architect Interns 2	Letters, Classifieds 4

Researchers go back to the garden

By Nancy Lovato

Sensors are housed in plastic sandwich containers within several greenhouses at the Huntington Botanical Gardens in San Marino.

Dr. Kevin Delin, below, shows another tiny sensor used to study microclimates.



Bob Brown / JPL Photo

Researchers and scientists are one step closer to measuring biological activity on other planets thanks to new sensor web technology studying life here on Earth. The new system, made up of small, wireless sensors, was developed by JPL engineers, and will eventually help establish a virtual presence for solar

system exploration. Like remote measurements obtained by satellites and telescopes, the webs allow large areas to be monitored. Unlike remote operations, however, sensor webs are placed within the environment—thus making them capable of on-site detection not possible from afar.

The prototype sensor web system, being tested in several greenhouses at the Huntington Botanical Gardens in San Marino, consists of 12 sensor pods, which quantitatively measure a number of environmental factors. The data is “hopped” from pod to pod, finally making it to a primary pod, which is connected to a computer that collects and stores the data.

“The beauty of this system is that the data collected is shared by all the pods,” said Dr. Kevin Delin, leader of JPL’s Sensor Webs Project. The collection of web pods can be looked at as a neural system embedded in the environment, Delin explained. “Just as neural synapses in the brain work off each other to produce intelligence, the collection of pods share information with each other, ultimately resulting in knowledge, rather than a mere collection of data.” He also noted that the individual pods can be upgraded one at a time, increasing the overall performance of the system, while not disturbing the functioning of the web itself.

Each pod, no bigger than the

size of a plastic sandwich container and some as small as a gumball, monitors soil temperature and moisture, light levels, local humidity, air temperature and gases every five minutes. “The pods all take quantitative data at essentially the same moment,” said Shannon Jackson, lead project engineer. Delin added, “It’s quite remarkable that the pods work in a synchronized manner when you realize that they are distributed over a large area and that most can’t communicate directly with each other.”

The pods are battery-powered. The batteries, which charge throughout the day via the solar panels located on the top of the

Pods, support the pods after the sun has set, enabling the system to run 24 hours per day. “I’m very happy with the way we are harvesting energy,” said Jackson. The sensor web has been running continuously for the last month, despite cloudy days and some unseasonal rains.

The environment in which these pods are being tested also appears to be working well. “The botanical gardens is a perfect place with the varied garden environments reflecting different microclimates,” said Delin. The Huntington Gardens house more than 15,000 kinds of plants from all over the world. With time, the project team hopes to “plant” other pods outdoors in the various gardens at the Huntington.

“We are delighted that Kevin included us in this project,” said Jim Folsom, director of the botanical gardens. “I’d like to think this is one way in which we can lift the veil of mystery between us and nature.”

Indeed, many unanswered questions may be addressed with these pods. On Earth, sensor webs may have a wide range of applications—from studying the carbon cycle on a planetary scale in intricate detail to locating, as opposed to just detecting, fires in buildings. The project team also looks forward to developing these sensor webs for extraterrestrial applications, such as detecting biological activity on Mars and studying the ice flow on Europa.

For more information, including pictures and animation, go online to <http://sensorwebs.jpl.nasa.gov>.



Interstellar sails successfully demonstrated

By Nancy Lovato

A lightweight sail (at right) that could be used to propel a spacecraft for interstellar exploration is depicted in this frame from an animation, where the sail receives beamed energy from a solar-powered satellite.

In two breakthrough developments, scientists have beamed microwaves and laser energy to “fill” lightweight sails in laboratory demonstrations of how these technologies might provide propulsion for interstellar exploration.

The sails used in the microwave experiment were actually driven to liftoff and flight, while the laser-driven sails achieved horizontal movement.

“These are really two giant steps forward,” said Henry Harris, task manager for the microwave levitation and laser experiments at JPL. “These results would not have been possible without newly developed ultralight, high-temperature sail materials and beamed-energy propulsion methods.”

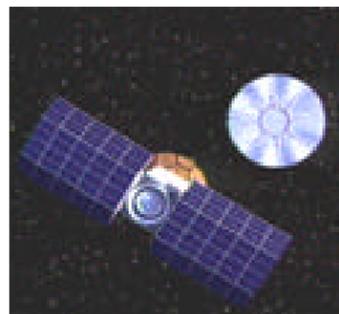
Future spacecraft that explore the depths of space will need to be very lightweight and be propelled by a reliable source of energy. Solar sails and microwave- and laser-beamed sails meet this requirement, with minimal weight since in the first case the “engine” is the Sun, and in the latter two the engine is left at the point of origin. They are driven by photons, particles of energy in which sunlight and other forms of electromagnetic radiation are emitted. By use of a remote laser or microwave source, beamed energy can be directed. In space, the source may be provided by a satellite or other type spacecraft.

The microwave-beamed sail experiment was conducted in a vacuum chamber at JPL, while the laser-driven experiment took place in another vacuum chamber at Wright-Patterson Air Force Base in Ohio. Both of these experiments appear to be firsts.

“Accelerations of several times the force of gravity were observed during the microwave tests,” said Dr. James Benford, project director and president, Microwave Sciences, Inc., Lafayette, Calif. “In one case,

the sail flew two feet in response to the high acceleration.”

About 10 kilowatts of microwave power were beamed to the sails. Analysis of data is underway to isolate the photon pressure effect from other possible causes of sail movement. In the other tests, laser powers



from 7.9 to 13.9 kilowatts were directed to the sails. Photon thrust was calculated from movements of the sails, which were mounted on pendulums. Future research will fine-tune the scientific understanding of flight using photon pressure.

Sails for both experiments were made of a very light but stiff carbon-carbon microtruss fabric that can withstand high temperatures typical of flight-level power densities. “These experiments are the first known measurements of laser photon thrust performance using lightweight sails that are candidates for spaceflight,” noted Dr. Leik Myrabo, associate professor at Rensselaer Polytechnic Institute, Troy, N.Y.

Both Benford and Myrabo are lead authors of papers describing the experiments. “Experimental Investigation of Laser-Pushed Light Sails in A Vacuum,” by Myrabo, was presented June 2 during the Advanced Propulsion Conference at JPL. Benford’s paper, “Microwave Beam-Driven Propulsion Experiments for High-Speed Space Exploration,” was presented at a conference in Scotland May 30-June 2 and also at the JPL conference. Knowles and Harris are among the co-authors on both papers. Harris is also co-investigator on the microwave experiment.

News Briefs



Michael Devirian

Devirian to lead Origins Program

MICHAEL DEVIRIAN, former manager of Space Science and Microgravity Flight Experiments, has been appointed as manager of the Origins and Fundamental Physics Program.

Devirian will oversee the projects and technology activities that will seek to answer questions about the formation of the universe, galaxies, stars, planets and life. Devirian will oversee two fundamental physics programs—the Space Science program, including the Laser Interferometer Space Antenna (LISA), and the Microgravity Fundamental Physics Experiment. In addition, he will operate in a supporting role for the Origins theme director at NASA Headquarters.

Devirian received his bachelor's degree in physics from the University of California, Riverside. He joined JPL in 1966 and was a member of the Lunar Surveyor team, Mariner Mars 1969 and Mariner Mars Orbiter 1971 projects. He served as director of flight operations during the development and flight phases of the Voyager Project, through the encounter with Jupiter in 1979. After working for nine years in Washington, D.C. as detailee to NASA Headquarters, he returned to JPL, where he worked on the Wide Field/Planetary Camera-II project for the Hubble Space Telescope.

Devirian received the NASA Medal for Outstanding Leadership for work on Voyager and the Medal for Exceptional Service for work on the Wide Field/Planetary Camera-II.

Simmons named SESPDP deputy

LARRY SIMMONS has been appointed as the deputy director of JPL's Space and Earth Science Programs Directorate.

As deputy director, Simmons will join in the directorate's responsibilities for all of the Laboratory's initial space flight project activities, except for missions to Mars. In addition, he will share in the responsibilities for all programmatic science activity, all flight instruments made at JPL and for NASA's Earth Science Enterprise flight missions.

Simmons will continue as program manager for the Space Infrared Telescope Facility, due for launch in 2001.

Simmons received his bachelor's degree in physics from UCLA. He has served in managerial expertise at JPL since 1969 on the Atmospheric Trace Molecule Spectroscopy Experiment, the Astrophysics and Microgravity Flight Experiments Office and the Wide Field/ Planetary Camera II. I

Deep Impact seeks comet observations

The JPL-managed Deep Impact mission, which will seek to hurl a

500-kilogram copper impactor into comet Tempel 1 five years from now, is seeking advanced charge coupled device (CCD) observers to monitor the comet from June through December 2000, when the comet passes through opposition and heads towards Jupiter.

Deep Impact's objective is to send a flyby spacecraft to Tempel 1 in 2004. During the summer of 2005, the spacecraft will launch the impactor toward the nucleus of the comet. The impactor will excavate a 20-meter crater in the nucleus, and the resulting impact will be observed by the spacecraft and by ground-based observatories.

Mission planners seek to develop computer models of the comet to aid mission design, and are looking to gather scientific data about the comet's brightness changes, coma structures and dust activity.

To meet this need for data, the project has established the Small Telescope Science Program, a network of professional and technically advanced amateur astronomers from around the world to make CCD observations of the comet through this December. Coverage of the comet is sought over several days as well as over several months.

To see observing requirements as well as CCD images taken by program observers, go online to <http://www.ss.astro.umd.edu/deepimpact/stsp>.

For more information about Deep Impact, go to <http://deepimpact.jpl.nasa.gov> or <http://www.ss.astro.umd.edu/deepimpact>.

Astronomical gathering coming up

The annual meeting of the Astronomical Society of the Pacific, to be held at the Pasadena Convention Center July 13-19, will include fun events for the whole family as well as a number of JPL exhibits and scientific presentations.

JPL is a co-sponsor of the event, which will include the Universe 2000 Family Expo, featuring Celestial Cinema, spotlighting popular astronomy videos, and a raffle/silent auction July 15 and 16. Kids in grades kindergarten through 12 can participate in an art contest or discover the wonders of space and science and enjoy hands-on activities at the KidSpace exhibit.

The expo will also include a series of speakers, panel discussions and history sessions. Cassini science advisor ELLIS MINER and astronomer DR. DONALD YEOMANS are scheduled lecturers.

JPL's participation also includes leading four educator workshops.

For prices and other information, go online to <http://www.aspsky.org/meetings.html>.



Larry Simmons

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. Call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the third Thursday of the month at noon in Building 167-111. Call Greg Hickey at ext. 4-0776.

Senior Caregivers Support Group—Meets the first Tuesday of each month in Building 167-111. For information, call the Employee Assistance Program at ext. 4-3680.

Friday, July 7

In-Situ Age-Dating of Martian Sediments—Dr. Stephen McKeever of Oklahoma State University will review the principles by which luminescence dating works, provide examples of its use on terrestrial eolian and fluvial deposits, and discuss the challenges to the development of luminescence dating as an in-situ age-dating technique for Mars—including projections for possible instrumentation and platforms (micromissions, landers and rovers). To be held at 1:30 p.m. in Building 306-302.

Tuesday, July 11

JPL Gamers Club—Meeting at noon in Building 301-227.

JPL Genealogy Club—Meeting at noon in Building 301-169.

JPL Stamp Club—Meeting at noon in Building 183-328.

Wednesday, July 12

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. Call Mary Sue O'Brien at ext. 4-5090.

Music on the Mall—The Glendale High School Coed Dancers will appear at noon.

Friday, July 14

Safety and Mission Assurance Directorate Briefing—Dr. Neda Fabris, professor of mechanical engineering at Cal State Los Angeles, will deliver a lecture titled "Thermal and Vibrational Analysis of Electronic Packages at 11:30 a.m. in the Building 167 conference room. Sponsored by Section 506. For information, call Rajeshuni Ramesham at ext. 4-7190.

Tuesday, July 18

JPL Hiking Club—Meeting at noon in Building 303-209.

Wednesday, July 19

JPL 2000 Lecture—"Stardust: Why, How and Where" will be presented by scientific investigator Ray Newburn, who will discuss where the mission stands today, a year and five months after launch, three and a half years before encounter, and five and a half years before Earth return. To be held from 11 a.m. to 12:30 p.m. in von Kármán Auditorium.

Investment Workshops—TIAA/CREF will present "Financial Education for Women" at 10 a.m. and "What are Tax Deferred Annuities?" at 2 p.m. Both will be held in Building 180-101.

Thursday, July 20

JPL Astronomy Club—Meeting at noon in Building 198-109.

Von Kármán Lecture Series—Robert Manning, who is leading a systems engineering study for the Mars 2003 geological mission, will present a lecture titled "Mars Engineering: Building a Vehicle to Land on Mars" at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, July 21

Von Kármán Lecture Series—Robert Manning, who is leading a systems engineering study for the Mars 2003 geological mission, will present a lecture titled "Mars Engineering: Building a Vehicle to Land on Mars" at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Interns selected for mission architect program

Three JPL researchers have been selected as interns in the Architect Development Program.

Drs. Alberto Behar, Albert Haldemann and Stuart Stephens were appointed by a selection committee to begin the two-year program.

Behar comes from the Robotic Vehicles Group in Section 345, where he has experience as a rover system engineer and camera engineer for the Muses-CN flight project, as

Haldemann comes from the Planetary Radar Group in Section 331 where, as a member of the engineering staff, he has developed planetary radar experiments and Deep Space Network scheduling. He also participated on the Mars Pathfinder science team in the landing site certification process, and in the field integration design and operations (FIDO) Rover instruments task.

Stephens also has a planetary science background and, as a member of the Science System Engineering Group in Section 314, has had recent flight operations experience with Galileo, Mars Polar Lander and Cassini. He is currently helping to plan the first Cassini observations of Jupiter later this year.

In its fifth year, the Architect Development Program is administered by JPL's Center for Space Mission Architecture and Design

The program will be tailored to fit interns' individual needs by having them participate extensively in the planning of their two-year internship. Each intern's plan will take advantage of their expertise and professional interests.

Under the auspices of JPL's Center for Space Mission Architecture and Design, the Architect Development Program aims to iden-

tify, select and train the next generation of mission architects who will design and implement future JPL missions.

The program allows interns to work on a variety of projects in a number of disciplines. Each intern will have the opportunity to work with the Advanced Projects Design Team (Team X), a team comprising representatives from all the major spacecraft and mission subsystems. Interns help develop mission proposals, become familiar with JPL tools in the automated design process, and work with JPL's industrial partners, gaining valuable perspective on how system design is performed. In addition, interns travel to other NASA centers, fill selected project-specific roles, and work within other JPL Centers of Excellence.

Interns will also study areas considered to be crucial to their development as a well-rounded mission architects. Typical of the classes offered are "Introduction to Space Science for Mission Architects," "Politics of Space," "JPL Proposal Preparation," and "Principles of Astrodynamics & Mission Design," to name a few.

Finally, each intern will be paired with a qualified mentor responsible for guiding and counseling that intern through the program.



Alberto Behar



Albert Haldemann



Stuart Stevens

chief engineer on the Antarctic Ice Borehole Probe, and as structural engineer for the Loi'hi underwater volcanic probe.

Numerous students spend their summer learning the JPL way

By *Gia Scafidi*

DISTINGUISHED YOUNG ADULTS are one step closer to successful careers, thanks to a variety of student employment programs offered at JPL. While helping students gain real-world, hands-on experience, these programs also assist the Laboratory in recruiting future regular JPL employees.

"The key to these programs is meaningful work experiences," said Dr. Gregor Edwards, of the Staffing and Employment Section. "Both JPL and the students benefit." The Lab presently has seven student employment programs.

Minority students can take part in ALVA (Alliance for Learning and Vision for underrepresented Americans) during the summer before their freshman year in college. Designed to increase minority participation in the engineering and science fields, this program is unique in that it provides its students with calculus and pre-calculus learning skills. JPL currently has eight ALVA students.

While ALVA represents a national minority-serving program focused on college-bound high school students, JPL's Geospace program takes place locally at John Muir High School in Pasadena. Through eight-week internships, students develop good work habits and get an idea of the number of career choices available.

Minority students also participate in JPL's From the Sun to the Star Nations outreach program,

which employs Native American students as interns, and the Minority Initiatives Intern (MII) program.

For eight weeks during the summer, Native American college interns contribute to JPL's technical areas and the Laboratory's communication outreach efforts.

This summer JPL has six Navajo students working at the Lab.

As MII interns, students from historically black colleges and universities and Hispanic and Native American-serving institutions also have the opportunity to work with JPL scientists and engineers on project-specific problems and activities. For 10 weeks, JPL's 18 MII students also attend weekly meetings, participate in a student career fair and present their work at the end of the program.

A presentation of one's work is also required of Summer Undergraduate Research Fellowship students. A Caltech program, SURF offers college students an opportunity to work on research projects with Caltech faculty or JPL technical staff members for 10 weeks during the summer. There are currently 43 students "SURFing"

on Lab.

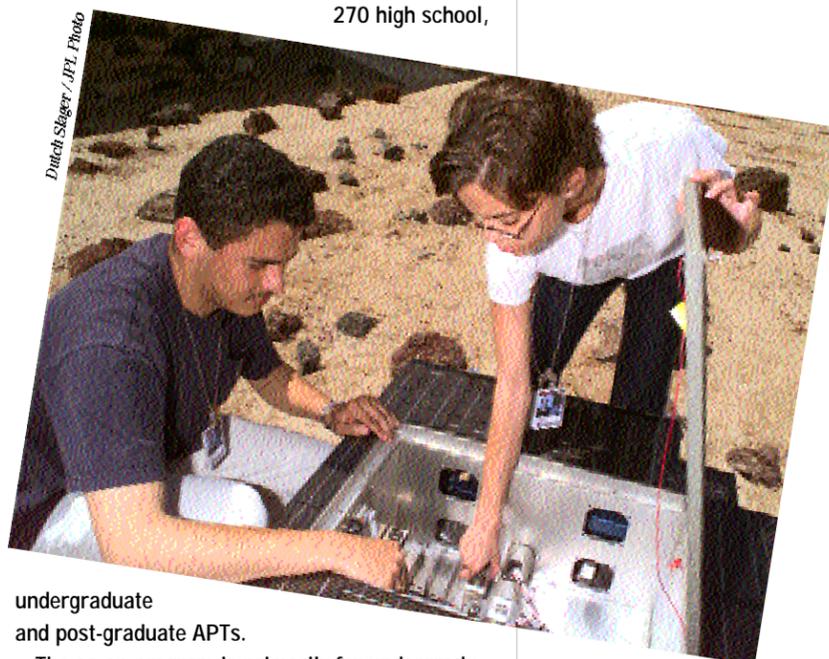
"These students get an outstanding head start," said Dr. William Whitney, acting deputy manager of the Educational Affairs Office. "Not only do they stand out among their

peers, but they develop a working technical vocabulary while they are here."

In addition to summer work, JPL also hosts year-round programs. The Academic Part-Time (APT) and Cooperative Education programs provide students with the opportunity to prepare for careers with on-the-job training as a supplement to their classroom instruction.

With opportunities for APT employment in almost every area at JPL, this program enables students to apply theories and principles learned in the classroom and develop transferable skills for potential full-time positions.

Presently, JPL has approximately 270 high school,



undergraduate and post-graduate APTs.

The co-op program is primarily for undergraduate students. It allows them to participate in a variety of scientific, technical and administrative assignments, and offers weekly seminars based on student interest. There are currently 87 co-op students on Lab.

While each employment program has unique requirements and qualifications, through hands-on experience and real-world exposure to professional environments, they all prepare JPL's students to make better-informed career decisions about their futures.

For more information on the ALVA, APT or co-op programs, contact the Staffing and Employment Section office at ext. 4-5150. To inquire about the Geospace, MII, From the Sun to the Star Nations or SURF programs, call the Educational Affairs Office at ext. 4-8252.

Summer co-op students Alfredo Ceja, left, and Michal Brown work on a flight test model of the Athena rover in the Mars Yard.

Educator workshops help teachers to better teach science

By *Gabrielle Birchak-Birkman*

shops at JPL, works with teachers on several reservations to empower educators with state-of-the-art research, supply the teachers with cutting edge resources and change the way in which science is taught. "You begin to see that we do a disservice in teaching science in the way we teach science," said Vosicky. "Science is a way of thinking. It's not just a subject to teach between 1 and 2 p.m. It's a never-ending process to get people to never stop asking questions."

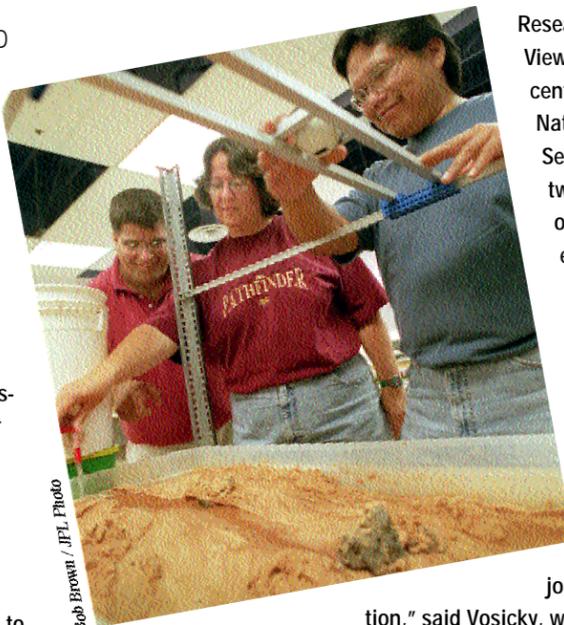
Currently, the JPL workshops are working with tribes such as Pima, White Mountain, Apache, Papago, Navajo, Zuni, San Carlos Apache, Pauma and Pala. Vosicky is working with Arizona State University's Tribal Coalition to develop an action plan with teams of teachers so that they can go back to the reservations with enhanced science, math and technology programs and skills to find community resources. "The first team was so excited that the district in Arizona has funded those people to come back to do more teacher training to continue to broaden out this program," said Vosicky.

Randii Wessen, supervisor of the Advanced Mission Systems Engineering Group, speaks to the educators and children in these workshops. He said that the way that science is taught is intimidating and stifling, and would like to change that to make science more exciting. "The thing I'm trying to do is give them a sense of awe," he said.

Each of NASA's 10 centers are funded to run two workshops that are focused at teachers in categories for kindergarten through 12th grade. The centers' programs work Native American teachers, rural teachers, urban areas, and educational venues such as museums. JPL and the NASA/Ames

THE WONDERFUL WORLD OF SCIENCE LIVES ON in the impressionable minds of hundreds of Native American children in the southwest, thanks to JPL's participation in NASA Educational Workshops.

Gene Vosicky, administrator of JPL's Educator Resource Center in Pomona and program manager for the work-



Bob Brown / JPL Photo

shop of promoting education," said Vosicky, who wrote the original grant proposal for the program. In the future, plans call for bringing in more tribes from the Grand Canyon area and the northwestern United States.

The importance of these programs, Vosicky said, is to promote analysis and systematic documentation for the students, and teach them how to interpret and communicate data of scientific findings. "As a result of this, you see a difference even in language arts," he said.

The workshops not only give teachers an understanding of what JPL does, but also expose them to subjects such as electricity at California Edison, botany at the Huntington Gardens and astronomy at Mount Wilson Observatory. In addition, scientists and engineers like Wessen visit the schools and speak to the students every chance they get.

Another dividend is the children's excitement and desire to learn about science and space exploration. "What I love is when I'll be walking on Lab and I'll run into someone who will say, 'Remember me? You got me into science!'" said Wessen.

The NASA-sponsored workshops are implemented in cooperation with International Technology Educational Association, National Council of Teachers of Mathematics, and the National Science Teachers Association. For more information, go online to <http://nsta.org/programs/new.htm> or <http://education.nasa.gov/NEW>.

Research Center in Mountain View are the two western centers that work with the Native American workshops. Selected teachers spend two weeks at JPL or Ames where travel expenses, housing and meals are included.

Since 1984, the workshops have enabled local teachers to spend six weeks at JPL. "One of the reasons it continues is because it does a really marvelous

job of promoting educa-

tion," said Vosicky, who wrote the original

Greg Gorney, left, Barbara Hightower and Melvin Gorman, all instructors at an Arizona Navajo reservation, work on Mars-related experiments at JPL's Educator Resource Center. Hightower releases erosion patterns as Gorman images the surface by manipulating a camera connected to a computer.

Bonus awards



JPL's Reward and Recognition Program recently bestowed Bonus Awards for Lab-wide accomplishments that have occurred since October 1999.

The three-tiered Bonus Awards Program was designed to incent and reward accomplishments and behaviors that will ensure future success of the Laboratory; reward outstanding teams and individuals that contribute to achieving JPL's goals and objectives; and increase JPL's competitive advantage through

strategic pay practices that differentiate high performance.

Level A recognizes Lab-wide accomplishments that impact JPL as a whole and

- Achieve one of JPL's significant goals or objectives,
- Enhance JPL's reputation, or
- Advance a field of knowledge.

Payout is \$3,500 per award.

For more information on Bonus Awards, visit <http://hr/compensation/bonusawards.html>.

The following employees received Bonus Awards in May.

Section 181: Franklin O'Donnell.

Section 215: Sally Hughes.

Section 222: Jienming Jou.

Section 233: Linda Graham.

Section 252: Karen Schlue.

Section 260: Randall Taylor.

Section 311: Robert Oberto.

Section 312: David Seal.

Element 3235: Dr. Michael Kobrick.

Section 331: F.H. Jim Taylor.

Section 334: Mimi Paller.

Section 341: Riley Duren, Edward Litty.

Section 344: Dr. Nikzad Toomarian.

Section 345: Greg Levanas.

Section 349: Patricia Westerlund.

Section 351: George Wells Jr.

Section 352: Donald Bickler, Howard Eisen.

Section 368: Christian Hidalgo, Donald Eagles.

Section 385: Dr. Thomas Cwik.

Section 388: Earl Hansen.

Section 389: Thomas Fouser.

Section 514: Linda Facto.

Section 661: Edward Bohanan.

Section 662: Araham Nasoordeen.

Section 701: Dr. Fuk Li.

Section 712: Gregg Vane.

Section 756: Dr. Marc Rayman.

Section 770: Dr. Jakob Van Zyl, C.A. Yamarone Jr.

Section 772: Moshe Pniel.

Section 776: Neil Herman.

Section 820: Dr. Barbara Wilson.

Section 871: Dr. Lynn Gref.

Section 900: Adrian Hooke.

Section 905: Wallace Tai.

Letters

I want to thank the great people in Section 352 and others at the Lab for the support they have given my husband and myself at the passing of my father-in-law. I would also like to thank the ERC for sending the beautiful calla lily.

Terri Scribner

Retirees

The following JPL employees retired in July:

Richard Mathison, 46 years, Section 900; Donald Johnson, 38 years, Section 344; William Spuck III, 38 years, Section 870; Larry Goforth, 36 years, Section 388; David B. Smith, 29 years, Section 306; Jeanne Stevens, 29 years, Section 369; Philip Stanton, 23 years, Section 333.

Classifieds

For Sale

AQUARIUM, 30 gal. w/Eclipse II filter sys., black stand, heater, thermometer, lights (1 white, 1 blue, 1 spare white), freshwater or beginner saltwater, \$300. 626/583-4717, Gabby.

BACKPACK, sm. metal frame, VG cond., \$50. 626/792-8248.

BEDROOM SUITE: 5-piece matching, honey maple, queen/full headboard, blended shades of wood; footboard & bedrails; 2 end tables w/drawers; vanity w/glass top appointment, adjustable full-length mirror, excellent condition, all 5 pieces \$595. 368-9520.

BOOTS, western: Nocona, 9 1/2 D, black/silver-tipped, fancy sides, \$85; Dan Post 9 D, lt. brown, dark fancy sides, \$65; Tony Lama 9D, black, plain, \$50, all exc. shape. 249-0453.

BREASTPUMPS, Medela: Pump-In-Style double, carrying case w/compartments, cold packs, complete w/manual, recent model, clean, exc. cond., \$75; Medela mini-electric single; small but powerful, clean, exc. cond., \$35; CRIB, lg., white wood w/mattress, pad/sheet/bumper guards, coverlet, adj., exc. cond., \$150. 626/285-9103.

CHINA CABINET, mid-20th century, Drexel, gd. cond., \$900. 353-9367.

COMPUTER, IBM 386 PC, 8 MB RAM, 60-MB HD, 13" display, incl. software, \$75;

OTTOMAN, '60s style, round/flat top, cream color vinyl w/leather texture, 12"x19"H, \$25; CHAIR, '60s style, straight-back, upholstered, dark olive fabric, walnut base, for office or LR, \$35. 626/289-2795.

CRIB, ChildCraft hardwood standard, innerspring mattress, quilt, knit sheets; all spotless; used only for grandchild visits; \$140. 323/255-3226.

DESK, lg., 30" x 30" x 59", \$100/obo. 626/564-8483, Chris or Nanci H.

DINING ROOM SET, Danish modern teak, 6 chairs, gd. cond., \$500/obo; BUFFET, matching, teak, \$250/obo; BAR, table top, w/light, sliding glass drs., \$50/obo. 790-6491.

DOG, German Shepard, purebred w/papers, \$75. 249-5773.

DRESSER, children's armoire, 6 drawers, closet area & 3 shelves, solid pine, 42"W x 49"H x 16"D, exc. cond., perfect for baby/child's rm., \$350/obo. 626/303-2808.

FURNITURE, Ethan Allen: couch, \$475; love seat, \$375; 2 end tables, 2 & library table, \$150 ea.; coffee table, glass top, \$200; curio cabinet, \$375; other: game table, 4 chairs, \$400; sofa bed, \$150; wedding dress, white satin, cathedral length train, sz.4-6, headpiece incl. \$250; knitting machine, studio, \$75. 626/355-6891.

GOLF CLUBS, Wilson 6, gd. cond., bag, cart, \$75; BIKES, 2, 24", 1-spd. girl's, 3-spd. boy's, Schwinn, old, \$50. 626/792-8248.

GUITAR, Epiphone Riviera, red, arch top, F-hole, bigsby, ohsc, proset rp, 2Hb, mint, easy play, great sound, \$400. 889-3059.

LAWN MOWER, Briggs Stratton, 3.5 hp, 21" rotary. 249-2357.

LUGGAGE, hard-sided, women's American Tourister, red, VG cond., 27", \$40, 24", \$30; Bel-Aire, lt. brown, VG cond., 22", \$20; men's Samsonite, drk. brown, fair cond., 27", \$10; 21", \$5. 626/577-8107.

METAL DETECTOR, Bounty Hunter, top of the line, hardly used, \$350. 248-6062.

MOVING SALE: desk, \$100; tv, \$150, coffee-maker, \$25; vacuum cleaner, \$50; phone, freedom, \$25, phone, reg., \$10; iron, \$10; table, round + extensions, \$200; chairs, 4, rattan, \$120; lamp, table \$15; mattress, queen, \$80; mattresses, 2, twin, \$40/ea.; lamp, desk, \$5. 626/585-1952, Michon H, remicusa@netscape.net.

ORGAN, Yamaha 415 elect. console, 13 pedals, 3 keyboards, 144 rhythm patterns, pd. \$7,500, sacrifice \$3,000; DIET TAPES, Jenny Craig, set of 14, \$50; POWER CONTROL CTR, computer, 5 pwr. + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, \$20; ADAPTERS, sprinkler valve, Lawn Genie, model 756LG 3/4, new, \$10 ea. 790-3899.

SNOWBOARD, Morrow Drive sz. 163, w/bindings; BOOTS, Airwalk all-mountain, men's, sz. 8, \$100 for all. 310/260-1024.

SPA, used, 10 yrs. old, air pump, water pump, filter, heater, solar panels, 80-gal. storage tank. \$500. 626/398-7262.

STOVE, O'Keefe & Merritt, 1950s, white porcelain, mint cond., 35"W, pan storage on left, \$275. 626/351-6551.

WARDROBE, antique English-designed, 2-door, solid wood, original shelving, lining and hardware including key, excellent condition, potentially 20-30's, \$225. 368-9520.

WASHER, Maytag, hvy. duty, 2 spd., lg. capacity, almond finish, VG cond., delivery possible. 248-8636.

WASHER/DRYER combo, Kenmore hvy. duty, perfect for sm. spaces, \$600. 626/289-3717.

Vehicles / Accessories

'93 ACURA Integra RS, 2 dr., black, a/c, Sony am/fm/CD player, rear spoiler, alarm, 103K mi., orig. owner, exc. cond., \$8,200/obo. 790-1419.

'83 CHEVROLET El Camino, blue, V8, 100K mi., \$3,500/obo. 626/284-2025.

'84 DODGE D-50 pickup truck, VG cond, auto, 2.6L, bedliner, shell, new batt. & carburetor, very clean, well maint., all service records, 138K mi., orig owner, \$2,800. 626/332-2682, Steve.

'97 FORD Escort, 4 dr., 5 spd., am/fm, only 12K mi., \$6,950. 626/796-3556.

'97 FORD Taurus station wagon, all pwr., built-in phone, 43K mi., exc. cond., \$10,500/obo. 626/798-8506.

'96 FORD Escort LX, exc. cond., 5 spd., 2 dr., 57K mi., a/c, am/fm/cass., \$6,900/obo. 909/323-3640.

'95 FORD Taurus GL wagon, exc. cond., 48,400 mi., new Michelin tires, V6, 3.0 L, auto, cc, a/c, am/fm/cass., pwr.seat/steer./locks/win., silver paint, gray int., cloth seats, orig. owner, \$8,500. 626/351-1219.

'90 FORD Bronco, 5.8L Eddie Bauer 4x4, loaded, a/c, cc, pwr./llw, 10 disc CD changer in console, well maint., gd. cond., \$5,500 cash. 661/255-6036.

'89 FORD Econoline 250 cargo van, new tires, hitch, s/r, chrome wheels, clean paint, runs great, orig. owner, 100K mi., \$3,000/obo. 248-7097.

'76 FORD Mustang II, 4 spd., 4 cyl. (rebuilt), new carb., primer gray color, black int., \$1,000/obo. 902-0138.

'72 FORD Bronco, tan, V8, 75K mi., dual limited slip differential, \$6,000/obo. 626/284-2025.

'66 FORD Mustang classic 289, V8, auto, all orig., strong engine, alarm, very clean, int. & ext. in exc. cond., must see to appreciate, \$5,200/obo. 626/289-0937, slundeen@pacbell.net.

'96 HONDA Civic, 5 spd., white, exc. cond., 28K mi., \$12,000/obo. 626/791-1245.

'90 HONDA Accord LX 4 dr. p/s/b/w/l, a/c, Kenwood stereo w/6 CD changer, 1 owner, well maint., 5 spd. manual, \$6,300. 248-6762.

'88 HONDA CRX, blue, exc. cond., 140K mi., auto, a/c, am/fm/cass., new tires, runs great, fuel efficient, \$3,500. 909/466-0443.

'98 MAZDA 626 LX, 4 dr., full pwr., 66K mi. (highway), slate blue, assume loan \$332, 34 months remaining. 249-1608.

'84 MILLER tiltbed equip. trailer, completely refurbished, new deck/tires/brakes/elec., 21,000 gross vehicle weight, \$3,995/obo. 626/798-6249.

'97 NISSAN Altima GXE, black, 4 dr., p/w, a/c, exc. cond., 70K mi., \$10,000/obo. 626/441-7384.

'89 NISSAN 240 SX, 5 spd., a/c, am/fm/CD, 127K mi., tinted win., exc. cond., \$2,750. 909/599-3230.

'90 PONTIAC Grand Prix LE coupe, red/silver, V6, auto, air, pwr. everything, tilt wheel, s/r, alloy wheels, new batt./tires, orig. owner, 80K mi., w/ cd. cond., \$3,500. 790-6952.

'99 TOYOTA Corolla LE, near new, scant miles, loaded, a/c, am/fm/cass./stereo, pwr. steering/window locks, extra value pkg., \$12,999/obo. 626/463-1269, x4019.

'90 TOYOTA Camry wagon, full power, roof rack, 111K mi., \$5,225/obo. 626/796-3556.

'85 TOYOTA van LE, dual a/c & sunroof, full pwr., VG cond., \$2,500. 714/527-3273.

'93 VOLVO 940 turbo wagon, mint cond., fully loaded, heated leather seats, s/r, ABS, pwr. everything, side impact protection sys., all service records, super clean, 74K mi. \$12,950. 790-2799, Larry.

'83 VOLVO 240 DL wagon, white, 17K mi., new timing belt & drive belts, \$1,300. 626/798-7339.

Wanted

CAR, family, trustworthy, reasonable, grand-ma-ish, 4 dr., auto. 626/744-5409.

DOGGIE DAY-CARE, have dog & apt., looking for person w/dog & fenced yard, to increase quality of life for both dogs, no increased expenses. 626/798-5705, Vicky Barlow.

GERMAN SPEAKERS/parents to form play group for toddlers to foster native language development. 249-9093, Petra.

JACKET, JPL Dunbrooke "Plajac", L or XL sz. 848-7072.

LIGHT METER, scale in foot-candles; DISC DRIVE, Jaz, for PC. 909/392-0379.

MAGAZINES, bridal/wedding, for pics only, any cond. 626/345-0681, Susanne.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.

TRUCK, small, pickup, for college student, gd. mech. cond. 626/358-7567, Bobbie.

VAN/CARPOOL, Saugus/JPL, M-F, 8-4:45, somewhat negotiable. 661/297-8108.

VOLLEYBALL PLAYERS, coed, all levels of play, Tues. nts., 8-10, Eagle Rock H.S., \$3/nt. 956-1744, Barbara.

Free

CAT, gorgeous, black & white "tuxedo", 1 yr. old, F, playful, affectionate, wish we could keep her, spayed, all shots, very clean & healthy, needs to be an only cat. 248-2855, Dave & Kelly.

KITTENS, 4, M, born May 4, need new homes, reserve, see at www.geocities.com/young_j_kim/kittensNeedHome.rtf. 249-2889.

STEPPING STONES, concrete, 13, circular (18" dia.), you pick up. 626/351-8643, eves.

For Rent

ALTADENA condo lease, mins. from JPL, 2 bd., 1 3/4 ba., nice closets w/organizers, f/p, c/a, comm. pool, storage rm., 2-car gar., carport, tile counter & marble flr. in kitchen, lg. patio, landscaped, planters/oriental garden/waterfall/spa, end unit w/wins. on 3 sides, rent by owner, \$1,200. 626/398-1988, Beverly Drane.

ALTADENA, charming 2-bd., 1-ba. house near Christmas Tree Lane, hrdwd. flrs., f/p, appliances, fenced backyard., fruit trees/rose, \$1,500, negotiable, incl. water/gardener/trash, see at www.alumni.caltech.edu/~chrisc. 626/794-9579.

ALTADENA, lg. furn. rm., cable, also share 3 bd., 3 ba. hilltop house, pool, patios, view (incl. JPL), c/a/h., all amen., kitchen, d/w, laundry rm., priv. off-st. pkg. spot, 11 min. JPL, smoking OK (owner smokes), \$500, incl. all util. + dep. 626/794-1050, Harry, after 7 p.m.

ALTADENA, share charming 2 bd. house in quiet neighborhood, Altadena Estate area, near New York Dr. & Allen, huge yard, patio, off-st. pkg., garage, storage, all privileges, avail. 8/28, all util. pd., \$625. 626/797-3354, bpeterson@huntington.org.

EAST PASADENA studio apt., 1 pkg. spot, incl. water/trash, no smoking/pets, carpet, blinds, stove, \$600 + \$600 sec. dep., avail. 7/1, 1 yr. lease. 949/643-9439.

LA CANADA-FLINTRIDGE, rm., private ba., kitchen, privileges, pool, BBQ, off-street pkg. 790-1280.

LA CRESCENTA, 1-bd. guest house w/private ent./parking, patio, laundry, c/a, quiet neighborhood, no smoke/pets, basic cable & util incl., \$695, avail. Aug 10. 957-2173.

PALM DESERT, exquisite, 2 bd., 2 ba. villa, for rent (or sale), vacations or long term, newly remodeled, skylight, patio, 2 car gar., located across the Living Desert, great private secure resort, tennis, multiple pools/spas, clubhouse facilities, great locality, around 2 top resorts. 909/620-1364.

PASADENA, charming 1920s apt. in 3-unit bldg. nr. Lake Ave. shopping, 2 bd., 2 ba., LR, DR, bonus, 1,450 sq. ft., f/p, hrdwd. flrs., lg. encl. deck, covered pkg./2 cars, W/D on premises, water/trash/gardener pd., \$1,400. 249-3602, 626/398-8865.

Real Estate

LA CANADA-FLINTRIDGE, view home, 4 bd., 2.5 ba., c/a, 2,778 sq. ft., 2-car gar., lg. driveway, 15-ft. swim spa, LC schools, very quiet st. & neighborhood, 53,954 sq. ft. on 2 lots w/oak forest & creek, 2.5 mi./JPL; see www.realtor.com, "La Canada", "Ca", MLS ID=G202353; \$849,500. 952-9654.

LA CRESCENTA, 2 story, 5 bd., 2.75 ba., La Crescenta schools, mtn./city view, hrdwd. flr., marble f/p, 2,196 sq. ft. liv. space, 500 sq. ft. encl. patios for den/family rm, 7,800 sq. ft. lot, yards w/grass, patio, fruit trees, gardens & sprinklers, c/a/h, newer d/w & roof, 2-car gar., reduced, www.geocities.com/young_j_kim/house_flyer.jpg, \$429K. 249-2889.

PASADENA, delightful 4 bd., 3 ba., Spanish style home in Caltech/So. Lake area, over 2,600 sq. ft., lg. rms., lots of light, f/p, newer kitchen, best price in area, offered by former JPL/Caltech emp., Sec. 336 10+ yrs., 615 S. Mentor, Pas., \$475,000. 626/229-0909, Lowell Hamburg, DBL Realtors.

VALENCIA, by owner, 3+2 fam. rm., walk to best schools, exc. area, a/c, f/p, in-ground spa, BBQ, covered patio, converted gar. w/ full ba., 27458 Cherry Creek Dr., \$196,500, firm, no realtors, see at <http://photos.yahoo.com/enriquemedina>. 569-2017 pager, 661/297-3933 home, enriquemedina@yahoo.com.

Vacation Rentals

BIG BEAR cabin, quiet area near village, 2 bd., slps. 8, compl. furn., f/p, TV/VCR, \$75/nt. 249-8515.

BIG BEAR LAKEFRONT, lux. townhome, 2 decks, tennis, pool/spa, beaut. master bd., suite, sleeps 6. 949/786-6548.

CAMBRIA ocean front house, slps. up to 4, exc. view. 248-8853.

HAWAII, Kappa, Kauai, 1 bd, 1 ba., ocean front condo, sleeps 4, full kitch., patio, pool, spa, sauna, BBQ grills, tennis, Oct. 21-28, \$90/nt. 323/296-6641.

HAWAII, Kona, on 166 ft. of ocean front on Keauhou Bay, priv. house & guest house comfortably sleeps 6; 3 bd., 2 ba., rustic, relaxing & beautiful, swimming, snorkeling, fishing, spectac. views, nr. restaurants/golf/other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, on beach w/ocean view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microw., d/w, pool, priv. lanai, slps. 4, 4/15-12/14, \$100/nite/2, 12/15-4/14, \$115/nite/2, \$10/nite add'l. person. 949/348-8047.

LAKE TAHOE, north shore, 2 bd., 2-1/2 ba. condo, slps. 6-7, private sandy beach, pool, great location, all amen., hike/golf/fish, 2 mi. to casinos, JPL disc., summer weekly rate \$650. 626/355-3886, Rosemary or Ed.

LAKE TAHOE, west shore @Homewood in Chamberlands, full amen., assoc pool, tennis, private beach & club, 3 bd. + loft, 2 ba., slps. 8, linens provided, full kitchen & laundry, TV/VCR, wood stove, 2 day min., \$700/wk., \$75 cleaning fee. 626/585-0321, Bob or Nicole.

MAMMOTH, Chamonix condo, 2 bd., 2 full ba., slps. 6, fully equip. elec. kitch. w/microw. & extras, f/p & wood, color TV, VCR, cable, FM stereo, pool & sun area, o/d Jacz., sauna, game, rec. & laundry rms, play & BBQ areas, convenient to hiking, shops, summer events, daily/weekly rates. 249-8524.

OCEANSIDE, on the sand, charming 1-bd. condo, panoramic view, walk to pier & harbor, pool/spa, game rm., slps. 4. 949/786-6548.

PACIFIC GROVE house, 3 bd., 2 ba., f/p, cable TV/VCR, stereo/CD, well-eqpd. kitch. w/microw, beaut. furn. close to golf, beaches, 17 Mile Dr., Aquarium, Cannery Row, JPL discnt. 626/441-3265.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd